Upper Gila Watershed 2002 Assessment

UPPER GILA WATERSHED CHARACTERISTICS

SIZE	7,354 square miles (6% of the state's land area).					
POPULATION BASE	Approximately 51,500 people live in this watershed (estimated from the 2000 census). This is about 1% of the state's population.					
LAND OWNERSHIP **(Figure 51)**	Tribal	28%	US Forest Service	23%	Private	9%
	Bureau of Land Management	22%	State	14%	Other state and federal	4%
LAND USES AND PERMITS **(Figure 52)**	Safford is the largest community in this watershed. In the Safford area, irrigated agriculture uses a high percentage of Gila River flow. Outside the Safford area, land use is primarily grazing and recreation with a minor amount of silviculture in the national forests. A major mining facility is located in the Clifton-Morenci area along the San Francisco River. In 1990, Congress passed the Arizona Desert Wilderness Act that designated the Gila Box Riparian National Conservation Area, and directed the BLM to conserve, protect, and enhance the riparian and wetland areas within the conservation area. There are also five designated Wilderness Areas and a Wilderness Study Area on Mount Graham that have restricted land uses.					
HYDROLOGY AND GEOLOGY	This watershed is defined by the Gila River drainage area from New Mexico to Coolidge Dam (San Carlos Reservoir). Perennial flow is limited to the Gila River above Safford, the San Francisco sub-watershed, Eagle Creek, the lower portion of Bonita Creek, a portion of the San Carlos River, and short stretches of tributaries on Mount Graham and Chiricahua Mountains. (Brown et al. 1978). The flow in the Gila River above the Safford Valley ranges from 11 cfs (in 1956) to 132,000 cfs (in 1983), with an annual mean of 477 cfs (USGS 1996). Ground water basins include: Bonita Creek, Duncan Valley, Morenci, and Safford. The Safford and Duncan ground water basins are large trough-like depressions formed by elongated mountain ranges composed of gneiss, schist, granite, volcanic material, and sedimentary rocks. These mountains rim a broad, alluvial-filled valley composed of the erosional remnants of these mountains. This alluvial fill constitutes the major aquifer in the Safford and Duncan Basins. Average discharge from wells is 1,000 gallons per minute. Ground water levels and movement in these two basins are strongly influenced by the Gila River (ADWR 1994). The Bonita Creek and Morenci ground water basins, within the Central Highlands province, have limited ground water resources. Most wells tap alluvial deposits along the major stream courses while the surrounding hardrock areas produce limited ground water quantities (ADWR 1994). The Hydrological Province is primarily the Basin and Range Province, but the northern third falls within the Central Highlands Province.					
UNIQUE WATERS	Designated Unique Waters in 2001: Bonita Creek, Cave Creek, and the South Fork of Cave Creek.					
ECOREGIONS	Primarily Southern Deserts. Northern edge in Arizona-New Mexico Mountains.					
OTHER STATES, NATIONS, OR TRIBES	San Carlos Apache Indian tribe is a significant stakeholder in this watershed with 58% of the watershed on tribal lands. Approximately 5,000 square miles of this watershed's drainage area extends into New Mexico.					

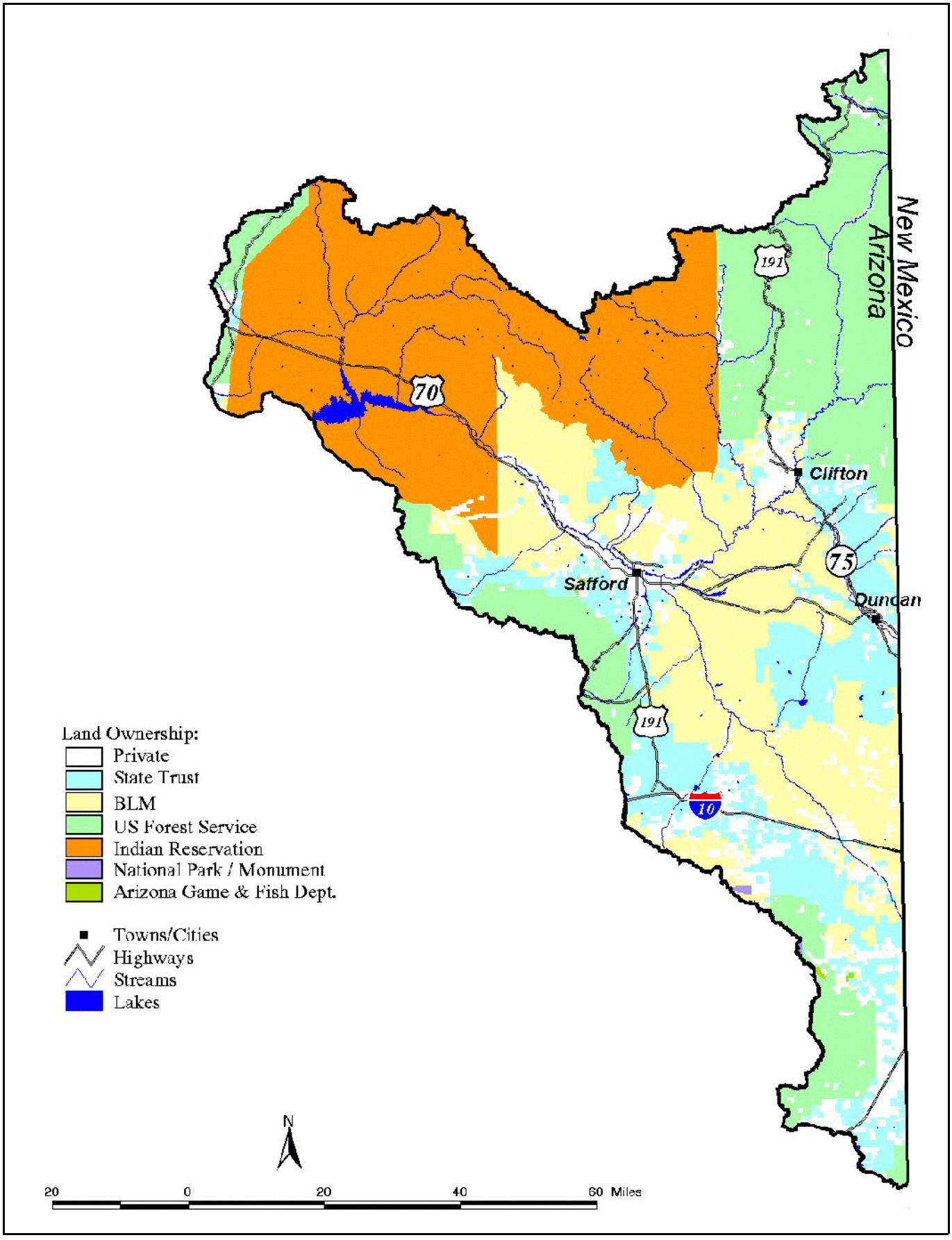

Figure 51. Land Ownership in the Upper Gila Watershed

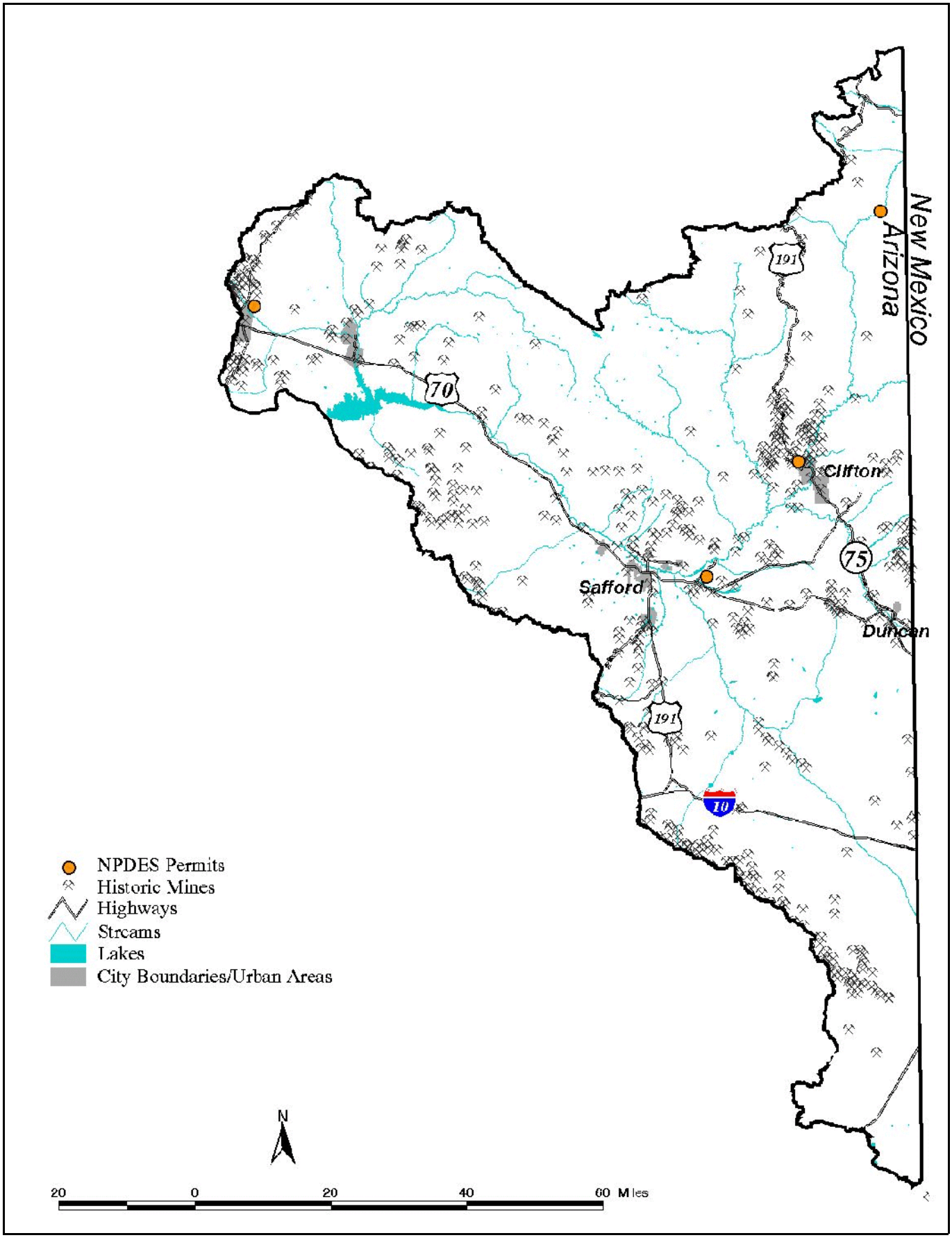

Figure 52. General Land Use and NPDES Permits in the Upper Gila Watershed

Upper Gila Watershed Assessment Discussion

Statistical Summary of Surface Water Assessments

Assessments – For the 2002 assessment, 320 stream miles and 153 lake acres were assessed. This assessment reflects data collected in 2000 when one of two focus watersheds.

Water quality assessment information for the Upper Gila Watershed is summarized in the following tables and illustrated on **Figure 53**.

Table 27. Assessments in the Upper Gila Watershed – 2002

	STREAMS		LAKES	
	miles	number of segments	acres	number of lakes
ATTAINING	252	17	33	2
INCONCLUSIVE	49	3	0	0
IMPAIRED	19	2	0	0
NOT ATTAINING	0	0	120	1
TOTAL ASSESSED	320	22	153	3

PERENNIAL SURFACE WATERS ASSESSED		STREAMS		LAKES	
		miles	number of segments	acres	number of lakes
	Assessed	320	22	153	3

* Note that streams with significant perennial stretches within the reach assessed were included in the perennial milage although part of the reach may have ephemeral or intermittent flow.

Inconclusive Assessments – Surface waters with some monitoring data, but insufficient data to determine if a designated use is attaining or impaired, were added to the new Planning List. By the end of the next watershed monitoring cycle (scheduled in 2005), ADEQ expects to monitor most of these reaches so that all designated uses can be assessed during the following assessment cycle. Other lakes and streams which lack monitoring data will also be monitored depending on resources and priorities.

ADEQ will be working with US Geological Survey and the Arizona Game and Fish Department, so that their future monitoring efforts will better support Arizona's surface water assessments.

Major Stressors – When a surface water is listed as impaired or not attaining a designated use, the pollutants or suspected pollutants causing the impairment are identified. In this watershed, two reaches were impaired by turbidity.

A nutrient TMDL was completed and approved by EPA for Luna Lake in 2000. Currently, ADEQ is scheduling monitoring to evaluate the effectiveness of TMDL implementation strategies.

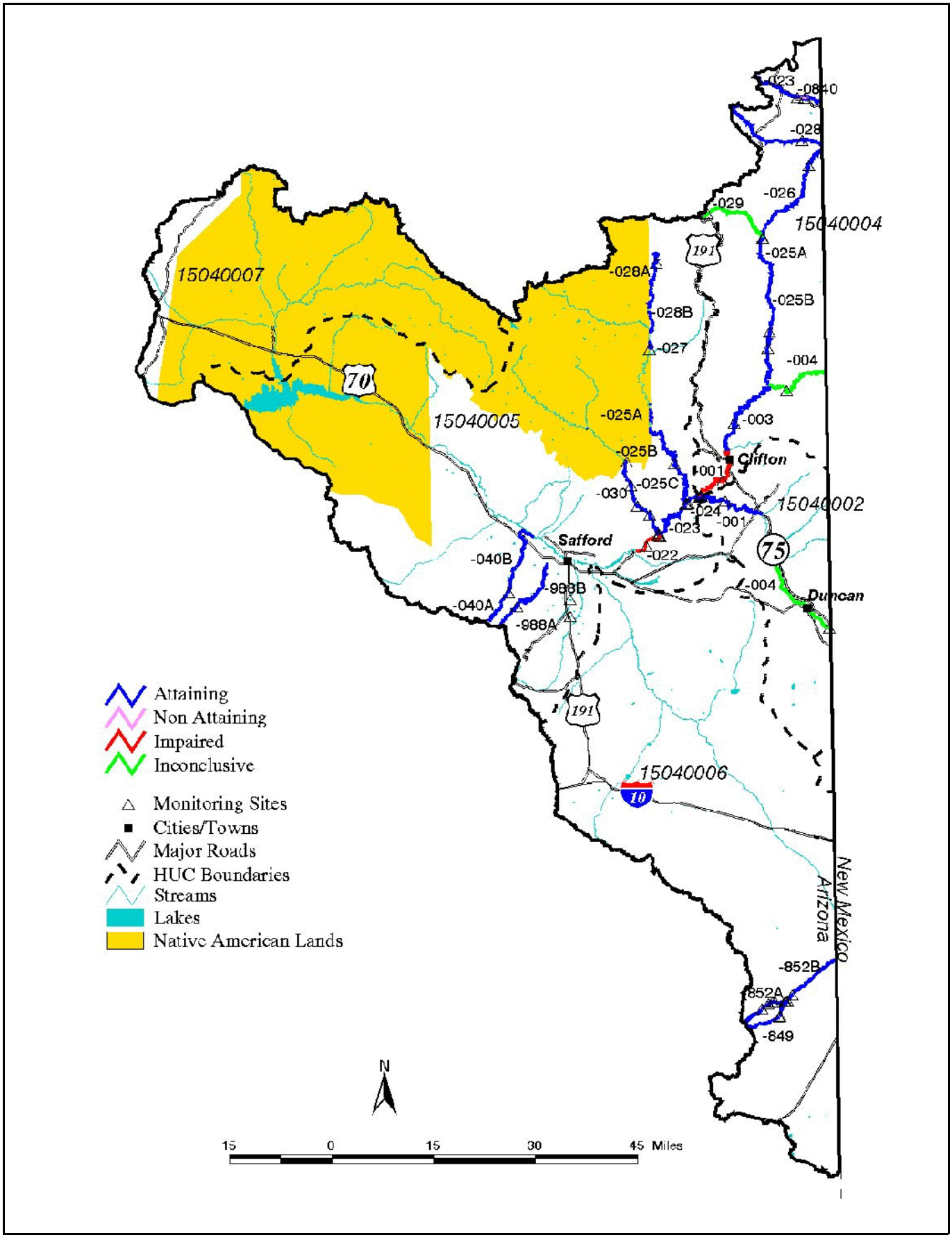

Figure 53. Upper Gila Watershed Surface Water Assessments – 2002

TABLE 28. UPPER GILA WATERSHED – MONITORING DATA – 2002 ASSESSMENT

STREAM NAME SEGMENT WATERBODY ID DESIGNATED USES	AGENCY AND PROGRAM SITE DESCRIPTION SITE CODE ADEQ DATABASE ID	YEAR SAMPLED NUMBER AND TYPE OF SAMPLES	STANDARDS EXCEEDED AT THIS SITE PER SAMPLING EVENT					
			PARAMETER UNITS	STANDARD (DESIGNATED USE)	RANGE OF RESULTS (MEAN)	FREQUENCY EXCEEDED STANDARD	DESIGNATED USE SUPPORT	COMMENTS
STREAM MONITORING DATA								
Ash Creek headwaters-Gila River AZ15040005-040 A&Wc, FC, FBC, AgL	ADEQ Fixed Station Network @ Forest Road #307 UGA1H008.62 100830	2000 - 3 suites	Dissolved oxygen mg/L	7.0 90% Saturation (A&Ww)	6.8-8.2 68-108%	1 of 3		
	Summary Row **A&Wc Inconclusive** **FC Attaining** **FBC Attaining** **AgL Attaining**	**2000** **3 sampling events**	**Dissolved oxygen mg/L**	**7.0 90% Saturation (A&Ww)**	**6.8-8.2 68-108%**	**1 of 3**	**Inconclusive**	**ADEQ collect 3 samples in 2000. Reach assessed as "attaining some uses." Add to Planning List due to one low dissolved oxygen.**
Blue River New Mexico -KP Creek AZ15040004-026 A&Wc, FC, FBC, AgI, AgL	ADEQ Biocriteria & Fixed Station Below Jackson Box (upper) UGBLR033.04 100419	1996 - 1 suite 2000 - 3 suites, 1 field	OK					
	Summary Row **A&Wc Attaining** **FC Attaining** **FBC Attaining** **AgI Attaining** **AgL Attaining**	**1996-2000** **4 sampling events**	OK				**Attaining**	**ADEQ collected 4 samples in 1996-2000. Reach assessed as "attaining all uses."**
Blue River KP Creek-San Francisco River AZ15040004-025 A&Wc, FC, FBC, AgI, AgL	ADEQ Fixed Station Network @ Juan Miller Road UGBLR005.68 100398	1996 - 6 suites 1999 - 5 suites 2000 - 4 suites	Dissolved oxygen mg/L	7.0 (A&Wc) 90% Saturation	6.3-9.6 88-115%	1 of 14		
			Turbidity NTU	10 (A&Wc)	<1-22	2 of 14		
	ADEQ Biocriteria program Above Fritz Ranch (lower) UGBLR008.07 100420	1996 - 1 suite	OK					
	ADEQ Fixed Station Network Below K P Creek UGBLR021.95 100835	2000 - 4 suites	OK					
	AGFD @ Stacey Crossing UGBLR	1997 - 1 suite	OK					
	Summary Row **A&Wc Attaining** **FC Attaining** **FBC Attaining** **AgI Attaining** **AgL Attaining**	**1996-2000** **21 samples** **17 sampling events**	**Dissolved oxygen mg/L**	**7.0 (A&Wc) 90% Saturation**	**6.3-9.6 88-115%**	**1 of 16**	**Attaining**	**ADEQ collected 20 samples at three sites and AGFD collected one sample in 1996-2000. Reach assessed as "attaining all uses."**
			Turbidity NTU	**10 (A&Wc)**	**<1-22**	**2 of 16**	**Attaining**	

TABLE 28. UPPER GILA WATERSHED – MONITORING DATA – 2002 ASSESSMENT								
STREAM NAME SEGMENT WATERBODY ID DESIGNATED USES	**AGENCY AND PROGRAM SITE DESCRIPTION SITE CODE ADEQ DATABASE ID**	**YEAR SAMPLED NUMBER AND TYPE OF SAMPLES**	**STANDARDS EXCEEDED AT THIS SITE PER SAMPLING EVENT**					
			PARAMETER UNITS	**STANDARD (DESIGNATED USE)**	**RANGE OF RESULTS (MEAN)**	**FREQUENCY EXCEEDED STANDARD**	**DESIGNATED USE SUPPORT**	**COMMENTS**
Bonita Creek Park Creek-Gila River AZ15040005-030 A&Ww, FC, FBC, DWS, AgL Unique Waters	ADEQ Fixed Station and TMDL Above Gila River UGBON000.20 100185	1997 - 1 suite, 5 metals 1998 - 1 suite 2000 - 4 suites	OK					
	ADEQ Stream Ecosystem Mon. Below infiltration gallery UGBON003.2 100186	1997 - 1 suite	OK					
	ADEQ Biocriteria program Above Gila River UGBON004.82 100421	1997 - 1 suite	OK					
	ADEQ Stream Ecosystem Mon. Below Lines Canyon UGBON007.9 100187	1997 - 1 suite	OK					
	ADEQ Fixed Station & Stream Ecosystem Monitoring Below Indian lands UGBON011.31 100188	1997 - 1 suite 2000 - 4 suites	OK					
	Summary Row **A&Ww Attaining** **FC Attaining** **FBC Attaining** **DWS Attaining** **AgL Attaining**	**1997-2000** **19 samples** **6 sampling events**	OK				**Attaining**	**ADEQ collected a total of 19 samples at 5 sites in 1997-2000. Reach assessed as "attaining all uses."**
Campbell Blue Creek headwaters-Blue River AZ15040004-028 A&Wc, FC, FBC, AgL	ADEQ Biocriteria & Fixed Station Above K E Canyon UGCMB002.16 100522	1996 - 1 suite 2000 - 4 suites	OK					
	Summary Row **A&Wc Attaining** **FC Attaining** **FBC Attaining** **AgL Attaining**	**1996-2000** **5 sampling events**	**OK**				**Attaining**	**ADEQ collected 5 samples in 1996-2000. Reach assessed as "attaining all uses."**
Cave Creek headwaters-USFS boundary AZ15040006-852A A&Wc, FC, FBC, AgI, AgL Unique Waters	ADEQ Unique Waters & Fixed Station Below ranger station UGCAV006.55 100937	1997 - 1 suite 1998 - 1 suite 1999 - 1 suite 2000 - 3 suites	Turbidity NTU	10 (A&Wc)	<1-64	1 of 6		Exceedance occurred during very high flow (normally <1 cfs, flow at 65 cfs). Not included in final assessment.

TABLE 28. UPPER GILA WATERSHED – MONITORING DATA – 2002 ASSESSMENT								
STREAM NAME SEGMENT WATERBODY ID DESIGNATED USES	**AGENCY AND PROGRAM SITE DESCRIPTION SITE CODE ADEQ DATABASE ID**	**YEAR SAMPLED NUMBER AND TYPE OF SAMPLES**	**STANDARDS EXCEEDED AT THIS SITE PER SAMPLING EVENT**					
			PARAMETER UNITS	**STANDARD (DESIGNATED USE)**	**RANGE OF RESULTS (MEAN)**	**FREQUENCY EXCEEDED STANDARD**	**DESIGNATED USE SUPPORT**	**COMMENTS**
	ADEQ Unique Waters & Fixed Station Below North Fork Cave Creek UGCAV007.64 100933	1997 - 1 suite 1999 - 1 suite 2000 - 4 suites	Turbidity NTU	10 (A&Wc)	<1-15	1 of 6		Exceedance occurred during very high flow (flow at 48 cfs while normally <1 cfs).
	ADEQ Unique Waters Program Above SW Research Station UGCAV008.49 11106	1997 - 1 suite 1998 - 1 suite 1999 - 1 suite	OK					
	ADEQ Unique Waters Program Above septic systems for summer homes UGCAV008.92 101107	1997 - 1 suite 1999 - 1 suite	OK					
	ADEQ Unique Waters Program Above Herb Martyr Campground UGCAV016.3 101108	1997 - 1 suite 1998 - 1 suite 1999 - 1 suite	OK					
	Summary Row **A&Wc Attaining** **FC Attaining** **FBC Attaining** **AgI Attaining** **AgL Attaining** **UW Attaining**	**1997-2000** **20 samples** **7 sampling events**	**Turbidity NTU**	**10 (A&Wc)**	**<1-64**	**2 of 20**	**Attaining**	**ADEQ collected 20 samples at 5sites in 1997-2000. Reach assessed as "attaining all uses."**
Cave Creek USFS boundary-New Mexico AZ15040006-852B A&Wc, FC, FBC, AgI, AgL	ADEQ Unique Waters Program Above South Fork of Cave Creek UGCAV007.70 101105	1997 - 1 suite 1998 - 1 suite 1999 - 1 suite	OK					
	ADEQ Unique Waters Program Below South Fork of Cave Creek UGCAV007.46 11104	1997 - 1 suite 1998 - 1 suite 1999 - 1 suite	OK					
	Summary Row **A&Wc Attaining** **FC Attaining** **FBC Attaining** **AgI Attaining** **AgL Attaining**	**1997-1999** **6 samples** **3 sampling events**	**OK**				**Attaining**	**ADEQ collected 6 samples at 2 sites in 1997-1999. Reach assessed as "attaining all uses."**

TABLE 28. UPPER GILA WATERSHED – MONITORING DATA – 2002 ASSESSMENT								
STREAM NAME SEGMENT WATERBODY ID DESIGNATED USES	**AGENCY AND PROGRAM SITE DESCRIPTION SITE CODE ADEQ DATABASE ID**	**YEAR SAMPLED NUMBER AND TYPE OF SAMPLES**	**STANDARDS EXCEEDED AT THIS SITE PER SAMPLING EVENT**					
			PARAMETER UNITS	**STANDARD (DESIGNATED USE)**	**RANGE OF RESULTS (MEAN)**	**FREQUENCY EXCEEDED STANDARD**	**DESIGNATED USE SUPPORT**	**COMMENTS**
Coleman Creek headwaters-Campbell Blue AZ15040004-040 A&Wc, FC, FBC, AgL	ADEQ Biocriteria program Below Turkey Creek UGCOL002.49 100523	1996 - 1 suite	OK					
	Summary Row	**1999 1 sampling events**					**Not assessed**	**Insufficient data to assess.**
Eagle Creek headwaters-Willow Creek AZ15040005-028 A&Wc, FC, FBC, DWS, AgI, AgL	ADEQ Biocriteria & Fixed Station Above Honeymoon Campground UGEAG035.99 100535	1996 - 1 suite 2000 - 4 suites	Dissolved oxygen mg/L	7.0 90% saturation (A&Wc)	5.8-8.2 (77-98%)	1 of 5		Staff documented that low dissolved oxygen was due to ground water upwelling that is naturally low in dissolved oxygen; therefore, not considered in the final assessment.
	Summary Row **A&Wc Attaining** **FC Attaining** **FBC Attaining** **DWS Attaining** **AgI Attaining** **AgL Attaining**	**1996-2000 5 sampling events**	OK				**Attaining**	**ADEQ collected 5 samples in 1996-2000. Reach assessed as "attaining all uses."**
Eagle Creek Willow Creek-Sheep Wash AZ15040005-027 A&Wc, FC, FBC, DWS, AgI, AgL	ADEQ Biocriteria & Fixed Station Below Sheep Wash Crossing UGEAG023.34 100536	2000 - 4 suites	Turbidity NTU	10 (A&Wc)	4-13	1 of 4		
	Summary Row **A&Wc Inconclusive** **FC Attaining** **FBC Attaining** **DWS Attaining** **AgI Attaining** **AgL Attaining**	**2000 4 samples**	**Turbidity NTU**	**10 (A&Wc)**	**4-13**	**1 of 4**	**Inconclusive**	**ADEQ collected four samples in 2000. Reach assessed as "attaining some uses." Add to Planning List due to turbidity exceedance.**
Eagle Creek Sheep Wash-Gila River AZ15040005-025 A&Wc, FC, FBC, DWS, AgI, AgL	ADEQ TMDL Program At confluence with Gila River UGEAG000.05 100817	1997 - 5 suites (1 suite, and 4 field, copper, zinc), 1998 - 1 suite	Dissolved oxygen mg/L	7.0 90% saturation (A&Wc)	5.6-10.0	1 of 6		Staff documented that low dissolved oxygen was due to ground water upwelling that is naturally low in dissolved oxygen; therefore, not considered in the final assessment.
			Turbidity NTU	10 (A&Wc)	1-233	2 of 6		
	ADEQ Fixed Station Network Below Gold Gulch @ Morenci UGEAG006.05 100806	2000 - 4 suites	Turbidity NTU	10 (A&Wc)	<1-26	1 of 4		

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STREAM NAME SEGMENT WATERBODY ID DESIGNATED USES	AGENCY AND PROGRAM SITE DESCRIPTION SITE CODE ADEQ DATABASE ID	YEAR SAMPLED NUMBER AND TYPE OF SAMPLES	STANDARDS EXCEEDED AT THIS SITE PER SAMPLING EVENT					
			PARAMETER UNITS	STANDARD (DESIGNATED USE)	RANGE OF RESULTS (MEAN)	FREQUENCY EXCEEDED STANDARD	DESIGNATED USE SUPPORT	COMMENTS
	Summary Row **A&Wc Inconclusive** **FC Attaining** **FBC Attaining** **DWS Attaining** **AgI Attaining** **AgL Attaining**	**2000** **10 sampling events**	**Turbidity** **NTU**	**10** **(A&Wc)**	**<1-233**	**3 of 10**	**Inconclusive**	**ADEQ collected 10 samples at 2 sites in 1997-2000. Reach assessed as "attaining some uses." Add to Planning List due to turbidity exceedances.**
East Turkey Creek headwaters -San Simon AZ15040006-837 A&Wc, FC, FBC, AgL	ADEQ Biocriteria program Above Forest Road 42 UGETK007.70 100545	1998 - 1 suite	OK					
	Summary Row	**1998** **1 sampling events**					**Not assessed**	**Insufficient data to assess.**
Frye Creek headwaters-Highline Canal AZ15040005-988 A&Wc, FC, FBC, AgI, AgL	ADEQ Biocriteria and Fixed Station At first crossing of Trail 36UGFRY007.00 100720	1996 - 1 suite 2000 - 3 suites	Dissolved oxygen mg/L	7.0 90% saturation (A&Wc)	6.3-7.8 (73-88%)	2 of 4		Staff documented that low dissolved oxygen was due to ground water upwelling that is naturally low in dissolved oxygen; therefore, not considered in the final assessment.
	Summary Row **A&Wc Attaining** **FC Attaining** **FBC Attaining** **AgL Attaining**	**1996-2000** **4 samples**	**OK**				**Attaining**	**ADEQ collected 4 samples in 1996-2000. Reach assessed as "attaining all uses."**
Gila River NM border-Bitter Creek AZ15040002-004 A&Ww, FC, FBC, AgI, AgL	USGS Station #0943200 Below Blue Creek, Virden, NM UGGLR213.01 100728	1998 - 6 suites 1999 - 5 suites 2000 - 4 suites	Turbidity NTU	50 (A&Ww)	1-130	3 of 15		Samples taken in New Mexico. Used only as supporting data. Not included in final assessment.
	ADEQ Fixed Station Network Duncan @ New Mexico border UGGLR205.35 100808	2000 - 2 suites	OK					
	USGS Station #09431500 Near Redrock, New Mexico UGGLR219.53	1996 - 6 suites 1999 - 3 suites 2000 - 3 suites	Turbidity NTU	50 (A&Ww)	<1-10,000	1 of 7		Samples taken in New Mexico. Used only as supporting data. Not included in final assessment.
	Summary Row **A&Ww Inconclusive** **FC Inconclusive** **FBC Inconclusive** **AgI Inconclusive** **AgL Inconclusive**	**1996-2000** **2 samples (in Arizona)**					**Inconclusive**	**ADEQ collected 2 samples in 2000. Reach assessed as "inconclusive"because of Insufficient data collected in Arizona. Exceedances in New Mexico and downstream in Arizona suggest that turbidity may be impairing this reach.**

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STREAM NAME SEGMENT WATERBODY ID DESIGNATED USES	AGENCY AND PROGRAM SITE DESCRIPTION SITE CODE ADEQ DATABASE ID	YEAR SAMPLED NUMBER AND TYPE OF SAMPLES	STANDARDS EXCEEDED AT THIS SITE PER SAMPLING EVENT					
			PARAMETER UNITS	STANDARD (DESIGNATED USE)	RANGE OF RESULTS (MEAN)	FREQUENCY EXCEEDED STANDARD	DESIGNATED USE SUPPORT	COMMENTS
Gila River Skully Creek-San Francisco AZ15040002-001 A&Ww, FC, FBC, AgI, AgL	ADEQ TMDL Program Above San Francisco River UGGLR195.11 100810	1997 - 1 suite + 4 metals, nutrients 1998 1 suite	Turbidity NTU	50 (A&Ww)	7-1000	5 of 6		
	ADEQ Fixed Station Network Above Old Safford Bridge UGGLR197.26 100809	2000 - 4 suites	Turbidity NTU	50 (A&Ww)	2-65	1 of 4		
	Summary Row **A&Ww Inconclusive** **FC Attaining** **FBC Attaining** **AgI Attaining** **AgL Attaining**	**1997-2000** **10 sampling events**	**Turbidity** **NTU**	**50** **(A&Ww)**	**2-1000**	**6 of 10**	**Inconclusive**	**ADEQ collected 10 samples at 2 sites in 1997-2000. Reach assessed as "attaining some uses." Add to Planning List due to turbidity exceedances.**
Gila River San Francisco River-Eagle Cr AZ15040005-024 A&Ww, FC, FBC, AgI, AgL	ADEQ TMDL Program Above Eagle Creek UGGLR193.68 100812	1997 - 1 suite + 4 field, Cu, Zn, 1998 - 1 suite	Turbidity NTU	50 (A&Ww)	7-458	6 of 6		
	ADEQ TMDL Program Below San Francisco River UGGLR194.91 100811	1997 - 1 suite + 4 field, metals 1998 - 1 suite	Turbidity NTU	50 (A&Ww)	6-701	6 of 6		
	Summary Row **A&Ww Inconclusive** **FC Attaining** **FBC Attaining** **AgI Attaining** **AgL Attaining**	**1997-2000** **12 samples** **6 sampling events**	**Turbidity** **NTU**	**50** **(A&Ww)**	**6-701**	**12 of 12**	**Inconclusive**	**ADEQ collected a total of 12 samples at 2 sites in 1997-2000. Reach assessed as "attaining some uses." Add to Planning List due to turbidity exceedances.**
Gila River Eagle Creek-Bonita Creek AZ15040005-023 A&Ww, FC, FBC, AgI, AgL	ADEQ TMDL Program Below Eagle Creek UGGLR193.47 100813	1997 - 1 suite + 4 field, Cu, Zn, 1998 -1 suite	Turbidity NTU	50 (A&Ww)	10-356	5 of 6		
	ADEQ TMDL Program Above Bonita Creek UGGLR190.39 100814	1997 - 4 suites + 1 field, bacteria 1998 - 1 suite	Turbidity NTU	50 (A&Ww)	12-413	4 of 6		
	Summary Row **A&Ww Inconclusive** **FC Attaining** **FBC Attaining** **AgI Attaining** **AgL Attaining**	**1997-1998** **12 samples** **6 sampling events**	**Turbidity** **NTU**	**50** **(A&Ww)**	**12-413**	**9 of 12**	**Inconclusive**	**ADEQ collected 6 samples in 1997-2000. Reach assessed as "attaining some uses." Add to Planning List due to turbidity exceedances.**
Gila River Bonita Creek-Yuma Wash AZ15040005-022 A&Ww, FC, FBC, AgI, AgL	ADEQ TMDL Program Below Bonita Creek UGGLR190.45 100815	1997 - 5 suites 1998 - 1 suite	Turbidity NTU	50 (A&Ww)	11-630	5 of 6		

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			PARAMETER UNITS	STANDARD (DESIGNATED USE)	RANGE OF RESULTS (MEAN)	FREQUENCY EXCEEDED STANDARD	DESIGNATED USE SUPPORT	COMMENTS
	USGS Station #09448500 Solomon above Safford Valley UGGLR188.98 100729	1996 - 6 suites 1997 - 6 suites 1998 - 6 suites 1999 - 5 suites 2000 - 4 suites	Escherichia coli CFU	580 (FBC)	<1- 2500	1 of 27		
			Fecal coliform CFU	4000 (A&Ww, AgI, AgL)	1-10000	2 of 27 more than 5 years apart		
			Turbidity NTU	50 (A&Ww)	<1-3000	8 of 27		
	Summary Row **A&Ww Impaired** **FC Attaining** **FBC Attaining** **AgI Attaining** **AgL Attaining**	**1996-2000** **33 samples**	**Turbidity NTU**	**50 (A&Ww)**	**<1-3000**	**13 of 33**	**Impaired**	**ADEQ collected 6 samples and USGS collected 27 samples in 1996-2000. Reach assessed as "impaired" due to turbidity.**
			Escherichia coli CFU	**580 (FBC)**	**<1- 2500**	**1 of 27**	**Attaining**	
			Fecal coliform CFU	**4000 (A&Ww, AgI, AgL)**	**1-10000**	**2 of 33 >5 years apart**	**Attaining**	
K P Creek headwaters-Blue River AZ15040004-029 A&Wc, FC, FBC, AgI, DWS	ADEQ Fixed Station Network @ Blue River UG0KP000.08 100889	2000 - 2 suites + 1 nutrients + field, bacteria	Dissolved oxygen mg/L	7.0 (90% saturation) (A&Wc)	6.2-7.6 (65-91%)	2 of 4		Staff documented that low dissolved oxygen was due to ground water upwelling that is naturally low in dissolved oxygen; therefore, not considered in the final assessment.
	ADEQ Fixed Station Network Below K P Cienega UG0KP006.59 100888	2000 - 1 suite	OK					Intermittent or ephemeral flow.
	Summary Row **A&Wc Inconclusive** **FC Inconclusive** **FBC Inconclusive** **AgL Inconclusive** **DWS Inconclusive**	**2000** **4 samples** **3 sampling events** **Missing core parameters**	**OK**				**Inconclusive**	**ADEQ monitored 2 sites in 2000. Reach assessed as "inconclusive" due to insufficient metals samples.**
North Fork Cave Creek headwaters - Cave Creek AZ15040006-856 A&Wc, FC, FBC, AgI, AgL Unique Waters	ADEQ Unique Waters Program Above confluence with Cave Cr. UGNCV000.03 101129	1999 - 1 suite	OK					
	Summary Row	**1999** **1 sampling event**					**Not assessed**	**Insufficient data to assess.**
San Francisco River headwaters-New Mexico AZ15040004-023 A&Wc, FC, FBC, AgI, AgL	ADEQ Fixed Station Network Above Luna Lake UGSFR059.98 100381	1996 - 4 suites + 2 bacteria 1999 - 2 suites 2000 - 2 suites	Dissolved oxygen mg/L	7.0 (90% saturation) (A&Wc)	5.6-9.4 (72-100%)	1 of 8		
			Turbidity NTU	10 (A&Wc)	6-61	7 of 8		

TABLE 28. UPPER GILA WATERSHED – MONITORING DATA – 2002 ASSESSMENT								
STREAM NAME SEGMENT WATERBODY ID DESIGNATED USES	**AGENCY AND PROGRAM SITE DESCRIPTION SITE CODE ADEQ DATABASE ID**	**YEAR SAMPLED NUMBER AND TYPE OF SAMPLES**	**STANDARDS EXCEEDED AT THIS SITE PER SAMPLING EVENT**					
			PARAMETER UNITS	**STANDARD (DESIGNATED USE)**	**RANGE OF RESULTS (MEAN)**	**FREQUENCY EXCEEDED STANDARD**	**DESIGNATED USE SUPPORT**	**COMMENTS**
	Summary Row **A&Wc Inconclusive FC Attaining FBC Attaining AgI Attaining AgL Attaining**	**2000 10 sampling events**	**Dissolved oxygen mg/L**	**7.0 (90% saturation) (A&Wc)**	**5.6-9.4 (72-100%)**	**1 of 8**	**Inconclusive**	**ADEQ collected 10 samples in 1997-2000. Reach assessed as "attaining some uses"and added to the Planning List due to DO and turbidity exceedances.**
			Turbidity NTU	**10 (A&Wc)**	**6-61**	**7 of 8**	**Inconclusive**	
San Francisco River New Mexico-Blue River AZ15040004-004 A&Ww, FC, FBC, AgI, AgL	ADEQ Fixed Station Network Near Martinez Ranch UGSFR017.66 100834	2000 - 4 suites	Turbidity NTU	50 (A&Ww)	3-74	1 of 4		Missing core parameters: insufficient metals samples.
	Summary Row **A&Ww Inconclusive FC Inconclusive FBC Inconclusive AgI Inconclusive AgL Inconclusive**	**2000 4 sampling events Missing core parameters**	**Turbidity NTU**	**50 (A&Ww)**	**3-74**	**1 of 4**	**Inconclusive**	**ADEQ collected 4 samples in 2000. Reach assessed as inconclusive" and added to the Planning List due to missing core parameters (metals) and turbidity exceedances.**
San Francisco River Blue R.-Limestone Gulch AZ15040004-003 A&Ww, FC, FBC, AgI, AgL	ADEQ TMDL Program and Fixed Station 6 miles above Clifton (& mining) UGSFR011.29 100708	1997 - 5 suites 1998 - 1 suite 1999 - 3 suites 2000 - 4 suites	Beryllium µg/L	0.21 (FC)	1.1	1 of 1		9 other beryllium samples were not included because the detection limit was too high to assess Fish Consumption.
			Turbidity NTU	50 (A&Ww)	1-872	4 of 11		
	Summary Row **A&Ww Inconclusive FC Inconclusive FBC Attaining AgI Attaining AgL Attaining**	**1997-2000 13 sampling events**	**Beryllium**	**0.21 (FC)**	**1.1**	**1 of 1**	**Inconclusive**	**ADEQ collected 13 samples in 1997-2000. Reach assessed as "attaining some uses"and added to the Planning List due to turbidity and beryllium exceedances**
			Turbidity NTU	**50 (A&Ww)**	**1-872**	**4 of 11**	**Inconclusive**	
San Francisco River Limestone Gulch-Gila River AZ15040004-001 A&Ww, FC, FBC, AgI, AgL	ADEQ TMDL Program At confluence with Gila River UGSFR000.04 100818	1997 - 6 suites 1998 - 1 suite	Turbidity NTU	50 (A&Ww)	3-176	2 of 6		
	ADEQ TMDL Program and Fixed Station Below Clifton (below mining) UGSFR003.04 100382	1996 - 6 suites 1997 - 4 suites + 1 metals, inorganics 1998 - 4 suites + 2 bacteria + 1 nutrients, metals 1999 - 5 suites 2000 - 4 suites	Beryllium µg/L	0.21 (FC)	<0.5-12.5	2 of 23		
			Beryllium µg/L	4 (FBC)	<0.5-12.5	1 of 23		
			Copper (dissolved) µg/L	varies (62) (A&Ww)	<10-170	1 of 29		
			Dissolved oxygen mg/L	6.0 (90% saturation) (A&Ww)	5.2-10.3 (82-133%)	2 of 27		
			Escherichia coli CFU	580 (FBC)	<2-3,200	1 of 24		

TABLE 28. UPPER GILA WATERSHED – MONITORING DATA – 2002 ASSESSMENT								
STREAM NAME SEGMENT WATERBODY ID DESIGNATED USES	**AGENCY AND PROGRAM SITE DESCRIPTION SITE CODE ADEQ DATABASE ID**	**YEAR SAMPLED NUMBER AND TYPE OF SAMPLES**	**STANDARDS EXCEEDED AT THIS SITE PER SAMPLING EVENT**					
			PARAMETER UNITS	**STANDARD (DESIGNATED USE)**	**RANGE OF RESULTS (MEAN)**	**FREQUENCY EXCEEDED STANDARD**	**DESIGNATED USE SUPPORT**	**COMMENTS**
			Fecal coliform CFU	4000	<2-4,600	1 of 20		
			Turbidity NTU	50 (A&Ww)	<1-1000	7 of 27		Only two samples were related to high flows.
	Summary Row **A&Ww Impaired FC Attaining FBC Attaining AgI Attaining AgL Attaining**	**2000** **33 samples 26 sampling events**	**Turbidity NTU**	**50 (A&Ww)**	**3-176**	**9 of 33**	**Impaired**	**ADEQ collected 33 samples at two sites in 1996-2000. Reach assessed as "impaired" due to turbidity.**
			Beryllium µg/L	**0.21 (FC)**	**<0.5-12.5**	**2 of 23**	**Attaining**	
			Beryllium µg/L	**4 (FBC)**	**<0.5-12.5**	**1 of 23**	**Attaining**	
			Copper (dissolved) µg/L	**varies (62) (A&Ww)**	**<10-170**	**1 of 29**	**Attaining**	
			Dissolved oxygen mg/L	**6.0 (90% saturation) (A&Ww)**	**5.2-10.3 (82-133%)**	**2 of 27**	**Attaining**	
			Escherichia coli CFU	**580 (FBC)**	**<2-3,200**	**1 of 24**	**Attaining**	
			Fecal coliform CFU	**4000**	**<2-4,600**	**1 of 20**	**Attaining**	
South Fork Cave Creek headwaters-Cave Creek AZ15040006-849 A&Wc, FC, FBC, AgI, AgL Unique Waters	ADEQ Unique Waters Program Above confluence with Cave Cr. UGSCV000.12 101109	1997 - 1 suite 1998 - 1 suite 1999 - 1 suite	Dissolved oxygen mg/L	7.0 90% saturation (A&Wc)	6.2-7.8 (85.6-97.4)	1 of 3		Staff documented that low dissolved oxygen was due to ground water upwelling that is naturally low in dissolved oxygen; therefore, not considered in the final assessment.
	ADEQ Biocriteria & Fixed Station Above South Fork Campground UGSCV002.26 100639	1997 - 1 field, nutrients, inorganics 1998 - 1 suite 1999 - 1 suite + 1 - metals, inorganics 2000 - 4 suites	Dissolved oxygen mg/L	7.0 90% saturation (A&Wc)	3.6-7.9 (39.5-91.3%)	3 of 7		Staff documented that low dissolved oxygen was due to ground water upwelling that is naturally low in dissolved oxygen; therefore, not considered in the final assessment.
			Turbidity NTU	10 (A&Wc)	<1-36	1 of 7		Very high flow (normally < 1 cfs, flow at 22 cfs). Pristine watershed.
	ADEQ Biocriteria Program Above South Fork Campground UGSCV002.45 100640	1998 - 1 suite	OK					

TABLE 28. UPPER GILA WATERSHED – MONITORING DATA – 2002 ASSESSMENT

STREAM NAME SEGMENT WATERBODY ID DESIGNATED USES	AGENCY AND PROGRAM SITE DESCRIPTION SITE CODE ADEQ DATABASE ID	YEAR SAMPLED NUMBER AND TYPE OF SAMPLES	STANDARDS EXCEEDED AT THIS SITE PER SAMPLING EVENT					
			PARAMETER UNITS	STANDARD (DESIGNATED USE)	RANGE OF RESULTS (MEAN)	FREQUENCY EXCEEDED STANDARD	DESIGNATED USE SUPPORT	COMMENTS
	Summary Row **A&Wc Attaining** **FC Attaining** **FBC Attaining** **AgI Attaining** **AgL Attaining** **UW Attaining**	**1997-2000** **11 samples** **7 sampling events**	**Turbidity** **NTU**	**10** **(A&Wc)**	**<1-35**	**1 of 11**	**Attaining**	**ADEQ collected a total of 12 samples at 2 sites in 1997-2000. Reach assessed as "attaining all uses."**
LAKES MONITORING DATA								
Dankworth Pond AZL15040005-0440 A&Wc, FC, FBC	ADEQ Lakes Program UGDAN-A 100018	1997 - 4 suites 2000 - 3 suites	Dissolved oxygen mg/L	7.0 (90% saturation) (A&Wc)	4.3-8.1 60-86%	5 of 6		Staff documented that low dissolved oxygen was due to ground water upwelling that is naturally low in dissolved oxygen; therefore, not considered in the final assessment. Naturally high fluoride levels in ground water. Exceedances not included in final assessment. Missing core parameters: *Escherichia coli*
			Fluoride mg/L	8.4 (FBC)	14-17	7 of 7		
			Selenium µg/L	20 (A&Wc)	<5-25	1 of 7		
	ADEQ Lakes Program UGDAN-B 100987	2000 - 2 nutrients, field	Dissolved oxygen mg/L	7 (90% saturation) (A&Wc)	4.4-7.7 (50-102%)	1 of 2		
	ADEQ Lakes Program UGDAN-Spring 1 (pond) 100988	2000 - 2 suites + 1 pH, DO	Dissolved oxygen mg/L	7 (90% saturation) (A&Wc)	3.6-5.8 (57-75%)	3 of 3		
			Fluoride mg/L	8.4 (FBC)	12.0-13.0	2 of 2		
	ADEQ Lakes Program UGDAN-Springs 2, 3, 4 100990, 100991, 100992	1997 - 1 suite 2000 - 1 suite (at 3 springs)	Dissolved oxygen mg/L	7 (90% saturation) (A&Wc)	0.1-2.6	4 of 4		
			Fluoride mg/L	8.4 (FBC)	12.0-17.0	2 of 2		
	Summary Row **A&Wc Attaining** **FC Attaining** **FBC Inconclusive**	**1997-2000** **13 samples** **7 sampling events** **Missing bacteria samples**	**OK**				**Attaining**	**ADEQ collected a total of 13 samples at 4 sites in 1997-2000. Lake assessed as "attaining some uses" and added to the Planning List due to missing core parameters (bacteria).**
Luna Lake AZL15040004-0840 A&Wc, FC, FBC, AgL	AGFD Routine Monitoring UGLUN	1997 - 1 suite 1998 - 2 suites	pH SU	6.5-9.0 (A&Wc, FBC, AgL)	8.4-9.9	2 of 3		Missing core parameters: *Escherichia coli*
	ADEQ Lakes Program UGLUN-A 100036	1997 - 4 suites 2000 - 1 suite	Dissolved oxygen mg/L	7 (90% saturation) (A&Wc)	5.4-10.1 (51-145%)	1 of 5		
			pH SU	6.5-9.0 (A&Wc, FBC, AgL)	7.2-9.7	2 of 5		
	ADEQ Lakes Program UGLUN-B 100979	2000 - 1 suite	OK					

TABLE 28. UPPER GILA WATERSHED – MONITORING DATA – 2002 ASSESSMENT								
STREAM NAME SEGMENT WATERBODY ID DESIGNATED USES	**AGENCY AND PROGRAM SITE DESCRIPTION SITE CODE ADEQ DATABASE ID**	**YEAR SAMPLED NUMBER AND TYPE OF SAMPLES**	**STANDARDS EXCEEDED AT THIS SITE PER SAMPLING EVENT**					
			PARAMETER UNITS	**STANDARD (DESIGNATED USE)**	**RANGE OF RESULTS (MEAN)**	**FREQUENCY EXCEEDED STANDARD**	**DESIGNATED USE SUPPORT**	**COMMENTS**
	Summary Row **A&Ww Not attaining** **FC Attaining** **FBC Not attaining** **AgL Not attaining**	**1997-2000** **9 samples** **7 sampling events** **Missing bacteria samples**	**pH SU**	**6.5-9.0 (A&Wc, FBC, AgL)**	**7.29-9.9**	**4 of 8**	**Not attaining**	**ADEQ collected 6 samples and AGFD collected 3 samples in 1997-2000. Reach assessed as "not attaining" due to exceedances and a TMDL completed and approved by EPA in 2000 for high pH and narrative nutrients. Added to the Planning List for effectiveness monitoring .**
			Dissolved oxygen mg/L	**7 (90% saturation) (A&Wc)**	**5.4-10.1 (51-145%)**	**1 of 8**	**Inconclusive**	
Roper Lake AZL15040005-1250 A&Ww, FC, FBC	ADEQ Lakes Program UGROP - A 100080	1997 - 4 suites 2000 - 3 suites	Dissolved oxygen mg/L	7.0 (90% saturation) (A&Wc)	5.4-9.1 (74-105%)	2 of 5		Staff documented that low dissolved oxygen was due to ground water upwelling that is naturally low in dissolved oxygen; therefore, not considered in the final assessment. Naturally high fluoride levels in ground water. Exceedances not included in final assessment. Missing core parameters: *Escherichia coli*
			Fluoride mg/L	8.4 (FBC)	6.8-18.0	7 of 7		
	ADEQ Lakes Program UGROP - B 100975	1997 - 4 suites 2000 - 3 suites	Fluoride mg/L	8.4 (FBC)	15.0-16.0	2 of 2		
	ADEQ Lakes Program UGROP - Pond 100976	2000 - 2 suites	OK					
	ADEQ Lakes Program UGROP - Canal 100978	2000 - 2 suites	Fluoride mg/L	8.4 (FBC)	15.0-16.0	2 of 2		
	Summary Row **A&Ww Attaining** **FC Attaining** **FBC Inconclusive**	**1997-2000** **18 samples** **7 sampling events** **Missing core parameters**					**Attaining**	**ADEQ collected samples at up to 4 sites during 7 sampling events in 1997-2000. Lake assessed as "attaining some uses" due to missing core parameters.**

Information for interpreting these Monitoring Tables

- "Segment" designates the beginning and end points of the reach.
- "Waterbody ID" is derived from combining the following: AZ (for streams) or AZL (for lakes) + a US Geological Survey Hydrologic Unit Code + EPA stream reach number or ADEQ lake number.
- "Designated Uses," "Agency," and "Units" (of measurement) abbreviations are defined in Appendix A.
- "Site Code" is an ADEQ derived abbreviation for the surface water basin, stream name or lake name, and the location of the site. For streams, the numbers are the miles upstream from mouth (normally measured as a straight line vector).
- "ADEQ Database ID" -- This is ADEQ's water quality database reference number. If the data is not in this database, no number will be shown.
- "Samples" -- The year and number of water samples is shown. The federal "water year" is used, from October 1st through September 30th, rather than the calendar year. Types of samples:
  - < "Suite" indicates that a broad range of chemical constituents were collected and field measurements were taken (normally inorganics, metals, nutrients, and bacteria.) The chemical constituents monitored are not consistent among the many monitoring entities that provided the data. If the suite did not include the core parameters needed to assess a designated use as "attaining," the missing core parameters are indicated.
  - < "Field" indicates that only field measurements such as dissolved oxygen, pH, turbidity, and water temperature were collected.
  - < If a specific parameter or parametric group (e.g., zinc, metals, bacteria) is named, monitoring was limited to only these parameters
- "Standards Exceeded at this Site per Sampling Event."
  - < Although many parameters may be analyzed, only those exceeding a standard are shown. Other parameters were collected.
  - < "OK" indicates that no standards were exceeded.
  - < The specific standards are shown as a single parameter may have multiple standards depending on the designated uses assigned. (See standards in Appendix C.)
  - < "The Range of Results" indicates the minimum and maximum sample results. If the laboratory reported result is "less than the detection limit" or "not detected," a less than (<) value will be shown along with the detection limit (e.g., <0.5 mg/L).
  - < A mean, geometric mean, or median will be shown along with the range of results if applicable to the standard or assessment criteria.
- "Comments" include other information used in interpreting the data for assessments, such as evidence that exceedance is solely due to natural conditions, or that the data does not meet the new "credible" data requirements.
- In the "Summary Row" parameter exceedances are combined from multiple sites, and the assessment of each designated use is shown. The overall assessment for the surface water is described in the "Comments" field: "Attaining," "Not attaining," "Impaired," or " Inconclusive." See assessment criteria in Chapter III of Volume I.

Ground Water Assessments in the Upper Gila Watershed

Major Ground Water Stressors -- Monitoring data collected from wells in this watershed between October 1995-October 2000 are summarized in **Table 29** and illustrated in **Figures 54, 55, and 56.**

Of the 50 wells monitored, nine exceeded fluoride standards, 7 exceeded standards for metals, and 5 exceeded nitrate standards. The location of the wells monitored and the wells exceeding standards is illustrated in **Figure 54**. Exceedances occurred across the watershed, rather than in an isolated pocket, except that wells in the southern section (around San Simon, Arizona) did not exceed metal standards.

TDS Concentrations -- Water quality can be characterized based on concentration of Total Dissolved Solids (TDS). High levels of salinity limits the practical uses of ground water in some areas of this watershed as TDS over 500 mg/L has an off-flavor, and TDS over 1000 mg/L will limit its use for some crops. As illustrated in **Figure 55**, the elevated TDS is scattered across the watershed, with exceptionally high concentration at one well in the San Simon area.

Watershed Protection Fund projects have been used to cap off one high saline well and investigate impacts of other wells (see discussion of these projects in the last section of this watershed).

No TDS water quality standards apply in this watershed and the elevated levels of TDS do not present a human-health concern for drinking water. The TDS concentration is only used to generally characterize water quality.

Nitrate Concentrations -- Water quality can also be characterized by looking at the concentration of nitrates in ground water. Natural occurring nitrate concentrations in ground water are generally below 3 mg/L. Concentrations above 5 mg/L indicate potential anthropogenic sources of nitrates. A total of eleven wells of the fifty wells sampled, exceeded this level. As illustrated in **Figure 56**, elevated nitrates occur in the San Simon area and downstream from Safford, both areas have significant irrigated crop production, which may be one source of the elevated nitrates.

When nitrate concentrations exceed 10 mg/L, Arizona's Aquifer Water Quality Standard has been exceeded. This standard was set to protect human health , as water with nitrate greater than 10 mg/L may present a health problem for infants and should not be consumed by nursing mothers. Five of the eleven elevated nitrate samples exceeded 10 mg/L. As many of the wells sampled are irrigation wells (not used for drinking water), nitrates over 10 mg/L may not represent a human-health concern. However, efforts should be made to minimize further ground water contamination by nitrate.

Table 29. Upper Gila Watershed Ground Water Monitoring 1996 - 2000

MONITORING DATA TYPE	PARAMETER OR PARAMETER GROUP	NUMBER OF WELLS			PERCENT OF WELLS EXCEEDING STANDARDS
		SAMPLED	SYNTHETIC CONSTITUENT DETECTED*	EXCEEDING STANDARDS	
INDEX WELLS	Radiochemicals	0		–	–
	Fluoride	1		0	0%
	Metals/Metalloids	1		0	0%
	Nitrate	1		0	0%
	VOCs + SVOCs*	0	–	--	--
	Pesticides	0	--	–	--
TARGETED MONITORING WELLS	Radiochemicals	5		0	0%
	Fluoride	47		9	19%
	Metals/metalloids	47		7	15%
	Nitrate	49		5	10%
	VOCs + SVOCs*	7	0	0	0%
	Pesticides	7	0	0	0%

WELL CLASSIFICATION BY TOTAL DISSOLVED SOLIDS (TDS) CONCENTRATION				
Total Number of Wells (all targeted wells)	Wells <500 mg/L Acceptable drinking water flavor	Wells 500-999 mg/L Fresh (not saline) Some crop production problems	Wells 1000-3000 mg/L Slightly saline Increasing crop production problems	Wells >3000 mg/L Moderately saline to briny Severe crop production problems
34	13	7	13	1

WELL CLASSIFICATION BY NITRATE CONCENTRATION (measured as Nitrogen)			
Total Number of Wells (only 1 index well)	Wells <5 mg/L	Wells 5-10 mg/L May be an anthropogenic source of Nitrates	>10 mg/L Exceeds standards Should not be used for drinking water by babies or nursing mothers
50	39	6	5

*VOCs = volatile organic compounds; SVOCs = semi-volatile organic compounds.
*The detection of a synthetic constituent (pesticides, VOCs, and SVOCs) is noted because some do not have standards and these substances are not naturally occurring in the ground water.

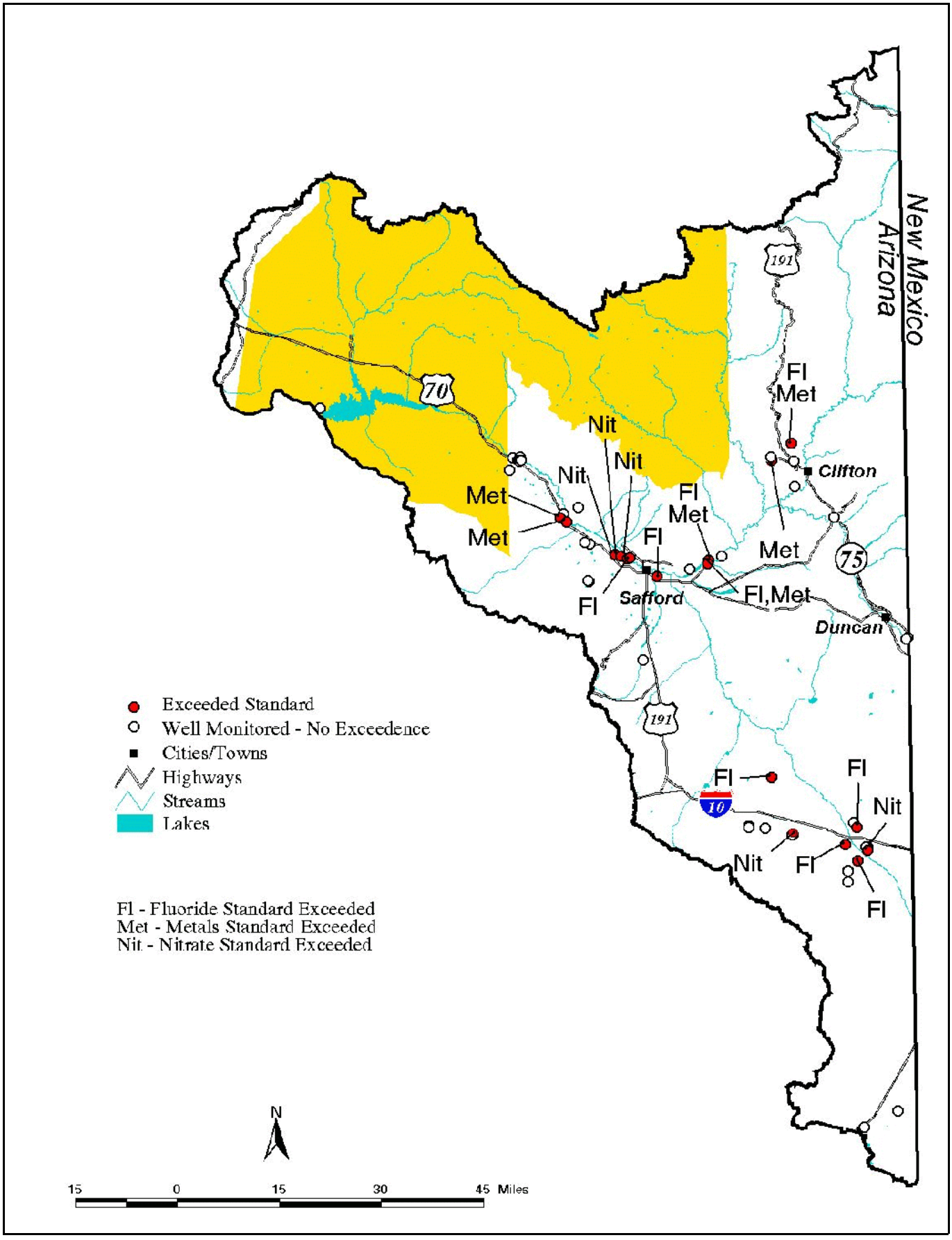

Figure 54. Ground Water Monitoring in the Upper Gila Watershed – 1996-2000

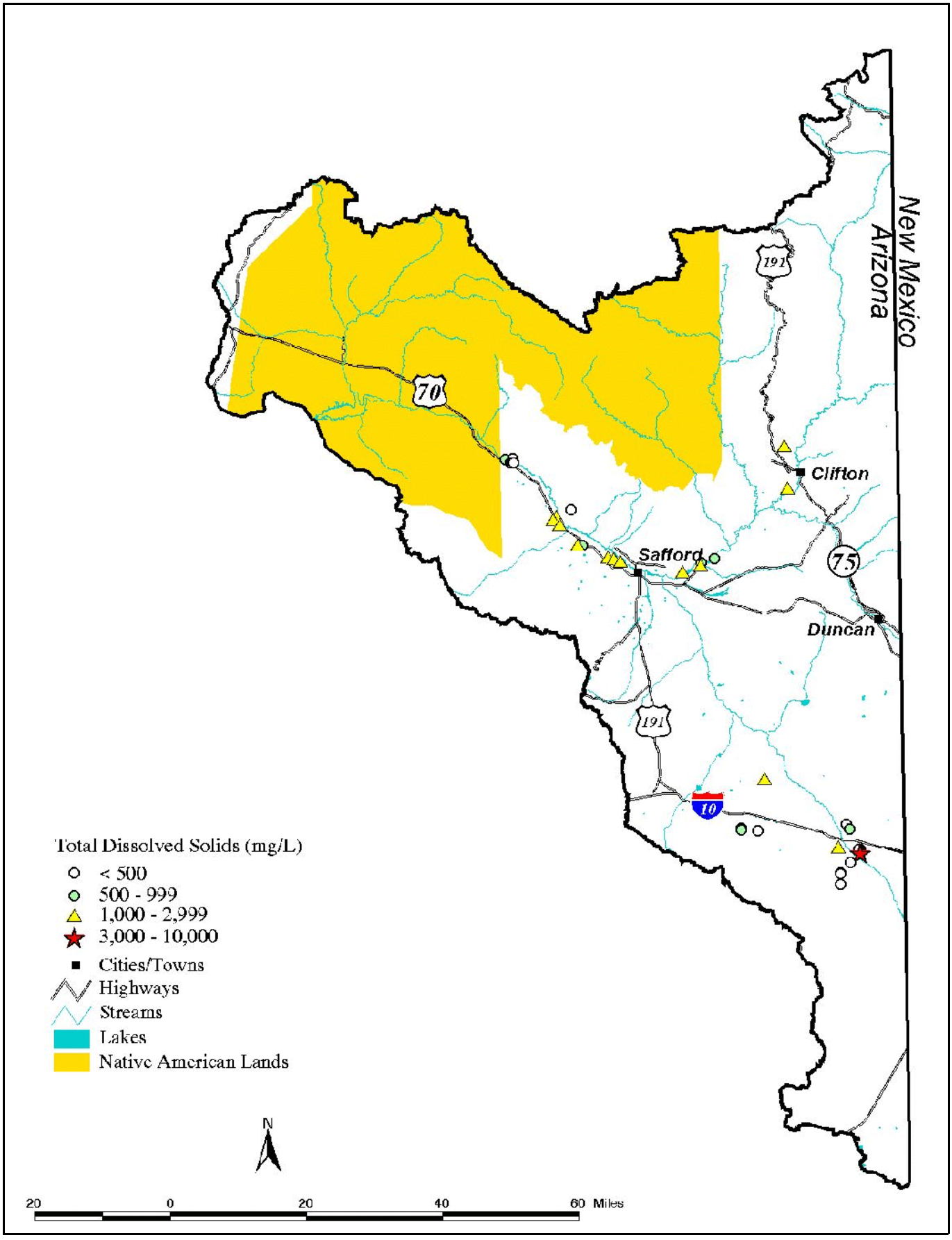

Figure 55. Ground Water Quality by TDS Concentrations in the Upper Gila Watershed

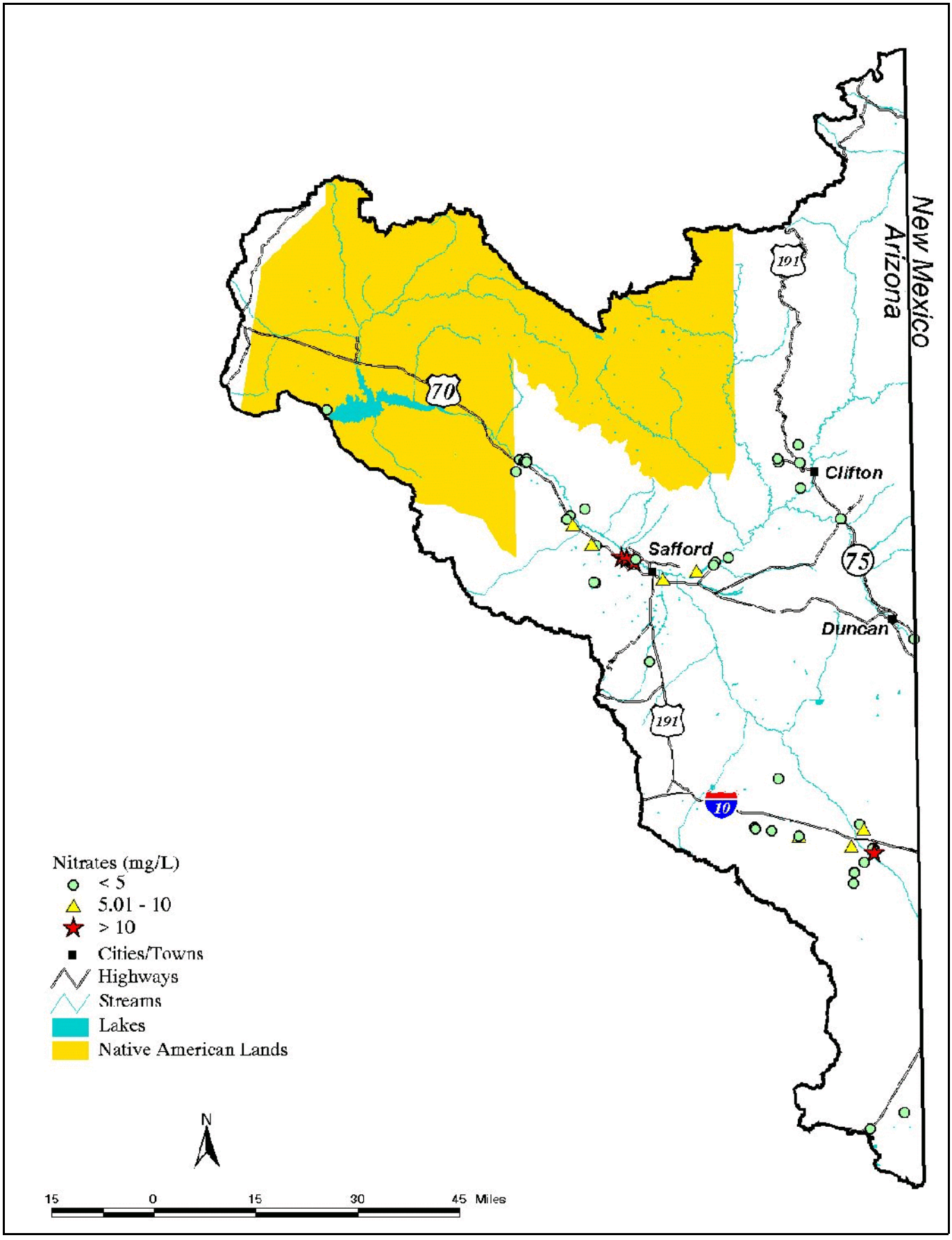

Figure 56. Ground Water Quality by Nitrate Concentrations in the Upper Gila Watershed

Watershed Studies and Alternative Solutions in the Upper Gila Watershed

This section highlights surface and ground water studies, mitigation projects, and remediation activities which have been conducted to improve water quality in the Upper Gila Watershed. Watershed partnerships active in this watershed are also mentioned.

Surface Water Studies and Mitigation Projects

Total Maximum Daily Load Analyses – The following TMDL analyses have been completed or are ongoing in this watershed. Further information about the status of these investigations can be obtained by contacting the TMDL Program manager at (602) 771-4468, or at ADEQ's web site: http://www.adeq.state.az.us/environ/water/assess/tmdl.html

- Luna Lake TMDL -- A TMDL for pH and excessive nutrients was completed and approved by EPA in 2000. Historic high external inputs of nutrients (nitrogen and phosphorus) to the lake, along with current in-lake nutrient cycling and many sunny days have resulted in a highly productive (eutrophic) system that has repeatedly failed to meet surface water quality standards.

  The TMDL investigation indicated that the following nonpoint sources contribute nutrients that lead to the impairment: septic systems, forest runoff, agricultural runoff, residential and commercial runoff, decomposition of aquatic plants (i.e., in-lake nutrient cycling), and ground water. To meet standards, the TMDL concluded that the following reductions from historic levels will need to be made:

  46% less nitrogen -- down to 69.4 pounds per day,
  67% less phosphorus – down to 19 pounds per day, and
  37% less chlorophyll *a* (a measure of algal production).

  The TMDL recommended the following reductions for the following nonpoint source categories :

	Nitrogen	Phosphorus
septic systems	50%	50%
residential	50%	50%
livestock	25%	25%
elk	25%	25%
macrophyte decomposition	60%	60%

The TMDL identified the following implementation options to meet these reductions:

- Determine the number of remaining septic systems that are in use and the extent to which unused systems are continuing to leach nutrients to Luna Lake. If there are a large number of active improperly functioning systems, the community could consider extending sewer lines.
- Implement voluntary grazing Best Management Practices that could reduce runoff and loading for pastures to reduce loading from domestic and elk herds.
- Implement voluntary Best Management Practices that reduce runoff from residential areas. This runoff is generally caused by impervious surfaces and soil amendments (e.g., fertilizers for lawns).
- Use dredging to remove the top meter of sediments that have accumulated most of the nutrients, and thereby, reduce nutrient recycling (Baker and Farnworth, 1995).
- Maintain a macrophyte harvesting schedule and/or biological controls of the macrophytes, as macrophytes will re-colonize Luna Lake within a short period of time after dredging has been completed.
- Increasing irrigation system efficiency to reduce irrigation water withdrawals, and thereby, provide higher quality lake water.

The goal of this TMDL is to incrementally improve water quality. ADEQ will work with the local community and cooperating agencies to develop a monitoring program for Luna Lake to assess whether the management actions are being met.

Water Quality Improvement Grants – ADEQ awarded the following Water Quality Improvement Grants in this watershed:

- Apache County Luna Lake Improvement Project -- Apache County will dredge accumulated sediment from Luna Lake to increase dissolved oxygen levels, reduce quantities of nutrient-rich sediments on the lake's bottom, lower average pH, and reduce total phosphorous. In addition, the county will establish water quality monitoring points along the San Francisco River to help identify locations of faulty septic systems and provide financial assistance to repair or replace faulty septic systems. For more information contact Cathy Cosgrove at (928) 333-2680 or heroconsulting@hotmail.com.

- Road Rehabilitation to Reduce Sediment in the San Simon Watershed – The Coronado Resource Conservation and Development District plans to rehabilitate 14 miles of unimproved roads within this sub-watershed using structures at strategic locations to decrease sediment loading to the San Simon. In addition, they are to increase public awareness of erosion and sediment control and how they relate to water quality within this watershed. For further information, contact Pete Brawley of the Upper Gila Partnership at (520) 428-2607.

Water Protection Fund Projects – The following projects received Water Protection Funds from the Arizona Department of Water Resources:

- Fluvial Geomorphology Study and Demonstration Project to Enhance and Restore Riparian Habitat on the Gila River from the New Mexico Border to the San Carlos Nation -- Several streams in this watershed are impaired due to excessive turbidity; therefore, significant resources are being invested to understanding the natural and anthropogenic fluvial geomorphic conditions and attributes that have lead to these exceedances. Gila County and the Upper Gila Partnership have initiated a landmark study of 100 miles of the Gila River from New Mexico border to the San Carlos Indian Nation border. This study will form the basis for the development of demonstration projects which will be implemented at optimum sites along the river to restore riparian vegetation, reduce flood velocity, and create a more stable channel. This project is being funded by the Arizona Watershed Protection Fund and the Bureau of Reclamation. The project is scheduled for completion in 2002.

- Gila Box Riparian and Water Quality Improvement Project – The Bureau of Land Management improved riparian habitat and water quality within the Gila Box Riparian National Conservation Area by moving livestock grazing from the river to adjacent upland areas. Approximately six miles of fencing were constructed and water lines, stock tanks, and water pumps were installed to provide water to the upland area. This project was completed in 1999.

- Eagle Creek Watershed and Riparian Stabilization Project –A private land owner received funds to improve the watershed, upland range and riparian community of Eagle Creek through the installation of fencing, grazing management, and the expansion of existing pipeline to distribute water sources throughout the upland areas. This project was completed in 1999.

- Creation of a Reference Riparian Area in the Gila Valley – Mt. Graham International Science and Culture Foundation created a highly visible riparian system along a tributary to the Gila River. The project was awarded Arizona Watershed Protection Funds in 2000 to provide outreach and education on the benefits of establishing and maintaining riparian areas and techniques used by land management areas.

- Blue Box Crossing – Greenlee County was funded to construct a hardened (concrete and riprap) crossing on the Blue river. The project site lies within a steep canyon of the Blue River, which is characterized by high intensity flows (estimated at 11 CFS normal flow and 17,000 CFS during extreme flood flows). The existing gravel crossing washes out in high flows increasing the sediment downstream. The area is habitat for the loach minnow, a species federally listed as Threatened with the potential to be listed as Endangered.

Gila River Resource Inventory – The Bureau of Land Management, the Gila Valley Natural Resource Conservation District, and the Upper Gila Partnership pooled resources in 1999 to develop a natural resources inventory and further studies to assist in developing Best Management Practices or other methods to

improve watershed conditions and reduce nonpoint source pollution .

San Simon Wash Suspended Sediment Monitoring Project –For a 13 year period beginning in 1983, the Bureau of Land Management conducted a monitoring project to determine the effectiveness of range management projects and practices within San Simon Wash drainage area. The parameters examined included: precipitation, storm water flow, movement of suspended sediment, free salt ions in solution (electrical conductivity). Range management practices included: a reduction of cattle numbers, fencing of riparian areas, construction of rock-masonry dams, installation of watering areas to disperse livestock and wildlife range use, concrete river fords, grass seeding, and other erosion control structures.

BLM concluded that the stream channel, and possibly some of the watershed, is slowly recovering from over 100 years of abuse. A decline in storm flow and sediment yield, were viewed as an indication that the construction of erosion control structures and implementation of a number of range management practices are effective.

Ground Water Studies and Mitigation Projects

Water Protection Fund Projects – Water Protection Funds were also used to fund the following ground water quality projects in this watershed:

- Abandonment of an Artesian Geothermal Wells – In 1999, Smithville Canal Company received funds to properly cap a deep, abandoned, artesian geothermal well near the Gila river, north of Thatcher Arizona. Discharge from the well was highly saline and was degrading soils and plants in the vicinity, and possibly, degrading downstream water quality in the Gila River. The grantee is now monitoring the site to evaluate changes due to well abandonment.

- Stable Isotope Tracers of Water Quality Constituents in the Upper Gila River – Decades of water quality monitoring have documented concentrations of total dissolved solids (TDS) in the Gila River and ground water, but the precise sources (both natural and anthropogenic) of the TDS are not known. In this project, the Arizona Geological Survey was to identify the sources and conveyance points of dissolved solids entering the upper Gila River through the use of naturally-occurring stable isotopes. The study area encompasses approximately 200 square miles in southeastern Arizona. Based on the results of the study, Arizona Geological Survey is to develop recommendations for mitigation of excessive TDS concentrations and further studies in the region. This project was completed in 1999.

- Tritium as a Tracer of Ground Water Sources and Movement in the Upper Gila Drainage – The Arizona Geological Survey also evaluated the use of tritium (a radioactive isotope) to distinguish between sources of ground water influencing the composition (and salinity) of the Gila River. Tritium can be used to determine the age of ground water. This study will assess the utility of using tritium to determine the degree of mixing between deep ground water in contact with highly soluble salts in the basin-fill sediments, and shallow ground water, which is a mixture of subflow from tributaries, infiltration of Gila River water and possible infiltration of irrigation water. This project was completed in 2000.

Federal and State Superfund Cleanup Sites -- One Superfund site is located in this watershed.

- The Safford Military Range Superfund Site -- This 400 acre site is administered by the Bureau of Land Management has been used by the Arizona Army National Guard (the Guard) since 1927for earth moving equipment training and bivouac activities. The Guard also operated a rifle range here from 1958 to the late 1970's. Recently, the Guard investigated the extent of soil contamination resulting from the numerous lead fragments located throughout the target areas. Lead contamination was shown to be present but confined within the upper six inches of soil. The Guard will to remove all the lead fragments and perform additional sampling to determine if further soil remediation is necessary.

Watershed Partnerships

The Upper Gila Partnership – The Upper Gila Partnership (previously known as the Safford-San Carlos-Duncan Partnership) was established in 1993 to develop and implement nonpoint source management strategies and projects in

the Upper Gila River Watershed. This citizen and agency based group has been instrumental in addressing water quality issues throughout the watershed, and has initiated many efforts to reduce nonpoint source pollution and educate citizens in the watershed on water quality concerns. Since its institution, its members have sought funding and implemented several important water quality improvement projects, including many of those describe above.

Currently, this watershed group is working to rehabilitate 14 miles of unimproved roads within the watershed using structures at strategic locations to decrease sediment entering the San Simon River. They are also administering the Gila River fluvial geomorphology study, and they have recently capped two saline artesian wells that negatively impacted water quality.

In 2000, the Upper Gila Partnership hosted a statewide video television conference concerning ADEQ's then new TMDL program.

For information about meetings, please contact Pete Brawley, Chairman, at (520) 428-2607.

Gila Watershed Forum (formerly the Gila Monster) – The Gila Monster interstate watershed group was formed to coordinate water quality improvement efforts in the upper Gila River drainage area in Arizona and New Mexico. It was formed by the Arizona Department of Environmental Quality in the early 1990's with a primary concern of nonpoint source pollution of water and a secondary concern for natural resources in general. The primary membership consisted of citizens from both states, conservation districts, and county, city, and town governments. They were supported by federal and state agencies concerned with natural resources in both states. Under their leadership, smaller member watersheds in New Mexico and in Arizona developed and implemented many useful projects to protect and enhance natural resources.

In 1998, political differences between factions in the two states began to render the Gila Monster ineffective; however, the four smaller watershed groups (three in New Mexico and one in Arizona) continued to meet on their own and to do important work. In 1999, a group of people began to meet in Silver City, New Mexico under the auspices of EPA Region VI (that oversees New Mexico but not Arizona) and the New Mexico Environmental Department. Using a hired negotiator, this group rewrote the goals and objectives of the former Gila Monster watershed group, changed the organization's bylaws and formed a new group called the Gila Watershed Forum.

Unfortunately, this conversion was done without consulting Arizona's watershed groups. By late 2000, the Gila Watershed Forum had invited the Upper Gila Partnership to attend their meetings and become a part of their activities. As of this writing in 2001, the Arizona watershed work group must still decide whether to accept the unilateral changes to the organization to encourage future opportunities for collaboration with New Mexico.